

BELLCOMM, INC.

SUBJECT: Trip Report: North American
Presentation on AAP-1A Study,
MSC, October 13, 1967 - Case 620

DATE: October 28, 1967

FROM: J. J. Gabrik

MEMORANDUM FOR FILE

The writer and D. Woodard attended a North American AAP-1A presentation at MSC on October 13, 1967. A summary of the data presented is given below.

NAA Study Effort

MSC requested NAA on September 15, 1967 to conduct a feasibility study on AAP Mission 1A to determine which of the 23 MSC assigned experiments could be integrated into the CSM for a 14 day CSM alone 1A Mission. They were to look at stowage location; mission duration based on consumable constraints; display requirements; data system requirements and constraints imposed by the CSM subsystems.

Additional ground rules included minimum modifications to the CSM; no EVA; the scientific airlock to be part of the unified hatch; RCS will be backup for deorbit; no change to the MSFN; and launch early 1969.

MSC is reviewing the data presented and will determine if any additional NAA study effort is required at this time.

Experiment Integration

The 23 experiments assigned by MSC for integration purposes consists of twelve experiments from the Apollo program and eleven early versions of the Applications A&B experiments. NAA assigned the highest priorities to the Apollo experiments and the lowest to the Applications experiments. This was done primarily because the Apollo experiments had priorities assigned by the MSFEB and the Application experiments have not been ranked to date. The NAA listing is presented in Attachment I.

Experiment locations were determined based on accessibility and data return requirements. The baseline of no EVA was interpreted to include no open hatches or cabin depressurization, consequently all of the experiments

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requiring manned operation and/or physical data return were examined for installation in the CM. Physical locations were found for eleven of the required 13. EO6-1 (metric camera) and EO6-7 (IR Imager) could not be located because of their physical size. The remaining ten experiments required only remote operation and were placed in Bay I of the Block II SM.

If EO6-4 (multi-spectral camera) is reduced from a six gang unit to a four gang unit (S065), it can be moved from the dome to the side window allowing the metric camera to be placed in the dome. Since EO6-4 is part of an experiment containing EO6-9A, EO6-9B and EO6-11 it was not known what the effect of the change would have on the experiment data.

Physical Integration

SC 109 was used as the baseline for modification because of its scientific airlock and optical right-hand side window. Changes, therefore, would be limited to mounting or supporting the experiments in the CM. Open viewing ports are to be cut in the SM for the experiments. They are to be closed during boost flight. The experiments can be mounted so that optical viewing is either perpendicular to the SM center line or the CM window.

A pressure dome containing an optical window is added under the forward boost protective cover to house experiment EO6-4. The experiment will be accessible through the forward hatch. The dome and experiment can be jettisoned during abort or recovery sequences.

Electrical

The total electrical energy required for the mission was calculated to be 595.5 KWH which is an average load of 1851 watts. This is assuming that the G&N is used for 162.5 hours of attitude hold required by the experiments. The hydrogen supply for this output is 56.7 lbs. The capacity of Block II tanks is 56 lbs. The deficit reduces the mission to 13.5 days. The oxygen requirement is 431 lbs and the supply capacity is 640 lbs providing an ECS O₂ allowance of 209 lbs. The ECS O₂ requirement is approximately 180 lbs.

Guidance and Control

NAA reliability studies have shown that the G&C usage should be limited to less than 30 hours. The mission profile requires a total of 162 hours of experiment attitude hold. There is little likelihood that the G&C will last for the required time thus the possibility of losing the primary mode of deorbit and reentry capability. A possible solution is attitude control for the experiments using manual SCS and the ORDEAL display for 142 hours out of the 162 required.

The G&C would be placed in the standby mode when not used. Studies are required to determine if the experiment pointing requirements can be met by the SCS.

RCS Propellant

The departure of AAP-1A from the Block II CSM design mission was studied to determine if any thermal problems could exist in the SM and CM structure and subsystems. It was determined that if unfavorable attitude holds were time limited and if real-time monitoring of temperatures throughout the CSM was accomplished, the thermal problem could be managed. Potential problem areas, however, do include the SPS components, the experiments and the experiments mounting areas.

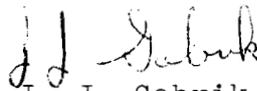
Data Systems

The studies to determine the experiment data system requirements were limited because of the short study time. Preliminary analysis of the experiments indicated that the present CSM instrumentation system could be used for some of the experiment housekeeping functions but additional tape recorders and wide-band telemetry systems would be required in the SM for storing and transmission of wide-band experiment data. It appears that the present wiring interface between the CM and SM may become overloaded by the experiment control and instrumentation requirements and would require extensive rework. Only a detailed analysis of these requirements will define the interfaces.

Documentation

A handout of notes and drawings "Mission 1A CSM Alone Feasibility Studies" is available.

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J. J. Gabrik

Attachment

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ATTACHMENT I AAP 1-A EXPERIMENTS

PRIORITY :		EXPERIMENT NO. :	EXPERIMENT TITLE
MSFEB:	AAP 1A:		
09	1	T003	Inflight Nephelometer
19	2	S015	Zero-G Single Human Cell
—	3	E06-4	Multi-Spectral Camera
25	4	S019	UV Stellar Astronomy
27	5	T004	Frog Otolith Function
29	6	S018	Micrometeoroid Collection
31	7	S020	UV/X-Ray Solar Photography
32	8	S017	X-Ray Astronomy
39	9	D017	CO ₂ Reduction
40	10	D008	Radiation
41	11	D009	Simple Navigation
42	12	T002	Manual Navigation Sightings
49	13	S016	Trapped Particle Asymmetry
—	14	S039	Day-Night Camera
—	15	S040	Dielectric Tape Camera
—	16	S043	IR Temperature Sounding
—	17	S044A	Microwave Radiometer
—	18	S048	UHF Sferics
—	19	E06-1	Metric Camera
—	20	E06-7	IR Imager
—	21	E06-9A	IR Radiometer
—	22	E06-9B	IR Spectrometer
—	23	E06-11	Microwave Radiometer

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ABSTRACT

NAA presented the results of a three week feasibility study to determine which of the 23 MSC assigned experiments could be integrated into a Block II CSM for AAP Mission 1A. They found that eleven of the 13 experiments requiring manned operation or CM environment could be located in the CM. The metric camera (EO6-1) and the IR Imager (EO6-7) could not be located because of their physical size. The ten experiments requiring only remote operation can be mounted in Bay I of the SM.

Preliminary studies indicate that there is a good possibility that the mission duration requirement of 14 days can be met. Duration depends heavily, however, on consumable usage due to attitude constraints and power requirements, details of which have not been established.